

**REMARKS**

Claims 1-13 are pending in this application. By this Amendment, claim 1 is amended to more particularly point out and more clearly define the subject matter Applicants regard as the invention. Support for this amendment can be found in the specification as filed, for example, at page 3, line 26-page 4, line 11 . Thus, no new matter is added by this amendment.

The courtesies extended to Applicants' representative by Examiner Lish and Examiner Henderson during the telephonic interview held October 6, 2003, are appreciated. In particular, Applicants gratefully acknowledge the helpful suggestions of the Examiners, which have been incorporated into the amendments to claim 1. The reasons presented at the interview as warranting favorable action are incorporated into the remarks below and constitute Applicants' record of the interview.

**I. Double Patenting Rejections**

**A. Same Invention Type Double Patenting**

The Office Action provisionally rejected claims 1-7 under 35 U.S.C. §101 as allegedly claiming the same invention as claims 1-7 of co-pending Application No. 10/098,379 and claims 1-7 and 19 of co-pending Application No. 10/098,103. Applicants respectfully traverse these rejections.

The test for same-invention type double-patenting is described in the Manual of Patenting Examining Procedure (MPEP) at §804, IIA and embodied in the cross-readability test discussed in such cases as Shelcore, Inc. v. Durham Industries, Inc., 745 F.2d 621, 628 (Fed. Cir. 1984). Under this test, a double patenting rejection is proper if a claim in the application could not be literally infringed without literally infringing a corresponding claim in the other application.

Claims 1-7 of this application and the cited claims of the co-pending applications do not disclose identical subject matter as the claims of this application could be literally infringed without literally infringing the claims in the corresponding applications. Claims 1-7 of the instant application set forth an electrode material for a lithium secondary battery. In contrast, claims 1-7 of co-pending Application No. 10/098,379 set forth an electrode material for an electric double layer capacitor and claims 1-7 and 19 of co-pending Application No. 10/098,103 set forth a carbon fiber. Applicants respectfully submit that claims 1-7 of the instant application clearly do not define the same invention as co-pending Application No. 10/098,379 and co-pending Application No. 10/098,103 and that the claims of this application could be literally infringed without literally infringing the claims in the corresponding applications.

Claims 1-7 of this application and claims 1-7 of each of the two co-pending applications do not claim identical subject matter. Reconsideration and withdrawal of the rejection are respectfully requested.

**B. Obviousness Type Double Patenting**

The Office Action also provisionally rejected claims 1-8 and 10-11 under the judicially created doctrine of obviousness-type double patenting as allegedly being unpatentable over claims 1-7 and 13-19 of co-pending Application No. 10/098,379; claims 1-9 and 19 of co-pending Application No. 10/098,103; claims 1-8 of co-pending Application No. 10/098,396; claims 1-12 of co-pending Application No. 10/098,312; and claims 1-9 of co-pending Application No. 10/098,461.

In response to the provisional obviousness-type double patenting rejection, Applicants attach hereto a Terminal Disclaimer. Applicants submit that these rejections are now moot. Applicants respectfully request withdrawal of the rejections.

## II. Claim Rejections

### A. Geus et al.

The Office Action rejects claims 1-8 and 10-11 under 35 U.S.C. §102(b) or, in the alternative, under 35 U.S.C. §103(a) over EP 0198558 A2 to Geus et al. with reference to Endo et al., "*Structural Characterization of Cup-Stacked-Type Nanofibers with an Entirely Hollow Core*". Applicants respectfully traverse this rejection.

Claim 1 sets forth an "electrode material for a lithium secondary battery comprising a carbon fiber, wherein the carbon fiber has a coaxial stacking morphology of truncated conical tubular graphene layers; wherein each of the truncated conical tubular graphene layers includes a hexagonal carbon layer and has a large ring end at one end and a small ring end at the other end in an axial direction; wherein at least part of edges of the hexagonal carbon layers is exposed at the large ring ends; and wherein the coaxial stacking morphology of truncated conical tubular graphene layers comprises stacked hexagonal carbon layers, each in the shape of a cup having no bottom."

The Office Action alleges that Geus teaches a vapor grown carbon fiber with stacked crystalline graphite layers forming a herring-bone, or stacked conical, structure. The Office Action further alleges that, in Fig. 2, the carbon layers have a large ring at the top end and a small ring at the bottom end in the axial direction, as well as a hollow core, or canal. Applicants respectfully disagree.

Geus describes the structure illustrated in Fig. 2 as "a fish bone-like arrangement of the graphite layers (basal planes) along an axis of the filament." See Geus, page 1, lines 4-6; page 3, lines 22-25; Abstract. More specifically, Geus teaches a carbon fiber, but does not teach an electrode material. In addition, Geus discloses that "two distinct orientations of the graphite layers were present. These two different orientations were localized on opposite sides of the filament axis." See Geus, page 19, lines 12-15. Thus, contrary to the assertions

of the Office Action, the structure illustrated in Fig. 2 has carbon layers (planes) extending on both sides of the axis. This structure resembles a fish bone and is different from that of a truncated conical tubular structure having a large ring end at one end and a small ring end at the other end, as recited in claim 1.

Because Geus discloses a filament having a well-defined direction of its axis and two distinct orientations of graphite layers localized on opposite sides of the filament axis (see Geus, page 19, lines 10-18), Geus does not disclose, in specific embodiments, an electrode material for a lithium secondary battery comprising a carbon fiber having a coaxial stacking morphology of truncated conical tubular graphene layers, wherein each of the truncated conical tubular graphene layers includes a hexagonal carbon layer and has a large ring end at one end and a small ring end at the other end in the axial direction, as recited in claim 1.

Further, Applicants have found that the fish-bone type herringbone carbon nanofiber produced by Gues exhibits no core or a small sized hollow core. The synthetic temperature for such nanofiber is at least below 800°C, generally around 600°C. The morphology of herringbone carbon nanofibers is such that they are not circular and have no core or a small-sized hollow core. According to the model of herringbone nanofibers, this fiber exhibits rectangular cross-sectional morphology. (See, for example, Rodriguez NM, Chambers A Baker RTK, Catalytic engineering of carbon nanostructures. *Langmuir* 1995; 11:3862-3866). In contrast, cup-stacked nanofibers, such as the carbon nanofibers according to claim 1, are synthesized at temperatures of at least 800°C, generally above 950°C. Such cup-shaped fibers exhibit a circular cross-sectional shape, and a large hollow core without an internal bridge.

Thus, Geus does not anticipate claims 1-8 and 10-11, and alone would not have rendered these claims obvious. Endo fails to remedy the defects of Geus.

Applicants respectfully submit that Endo is not a citable reference with respect to the instant application. The instant application claims priority to Japanese Patent Applications

JP 2001-162185 and JP 2001-260430, filed May 30, 2001 and August 29, 2001, respectively. Applicants respectfully submit that Endo published on February 18, 2002, after the filing of the priority applications. Applicants hereto attach verified English-language translations of JP 2001-162185 and JP 2001-260430. Applicants thus submit that Endo is not a proper prior art reference.

For the at least the foregoing reasons, Applicants respectfully submit that Geus fails to anticipate and would not have rendered obvious the subject matter of claims 1-8 and 10-11. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

**B. Ikeda et al.**

The Office Action rejects claims 9-13 under 35 U.S.C. §103(a) over EP 0198558 A2 to Geus et al. as applied to claims 1-8 and 10-11 and further in view of WO 95/07551 to Ikeda et al. Applicants respectfully traverse this rejection.

Claims 9-13 depend, directly or indirectly, from claim 1, which is as recited above.

As discussed above, Geus discloses a filament having a well-defined direction of its axis and two distinct orientations of graphite layers localized on opposite sides of the filament axis. Also as discussed above, because Geus does not disclose, teach or suggest an electrode material or an electrode material for a lithium secondary battery comprising a carbon fiber having a coaxial stacking morphology of truncated conical tubular graphene layers, wherein each of the truncated conical tubular graphene layers includes a hexagonal carbon layer and has a large ring end at one end and a small ring end at the other end in the axial direction, as recited in claim 1, Geus alone would not have rendered claim 1 and the dependent claims 9-13 obvious.

Ikeda does not remedy the shortcomings of Geus.

Ikeda discloses using the fishbone carbon fibrils of Geus to form a lithium battery having Geus fibrils contained in the anode and/or cathode material. The Office Action is

correct in stating that it would have been obvious to use the Geus carbon fibrils in the lithium battery of Ikeda, as is claimed in Ikeda.

However, Ikeda does not disclose, teach or suggest carbon fibers having a coaxial stacking morphology of truncated conical tubular graphene layers, wherein each of the truncated conical tubular graphene layers includes a hexagonal carbon layer and has a large ring end at one end and a small ring end at the other end in the axial direction, or an electrode material comprising such carbon fibers.

Since neither Geus nor Ikeda disclose, teach or suggest an electrode material as set forth in claim 1, or a carbon fiber as set forth in claim 1, there can be no motivation to combine the references and modify the resultant combination to produce an electrode material for a lithium secondary battery comprising a carbon fiber as set forth in claim 1. Likewise, Geus and Ikeda do not disclose, teach or suggest an electrode material as set forth in claims 9, 10 or 11 or a lithium secondary batteries as set forth in claims 12 and 13. Accordingly, one of ordinary skill in the art would not have been motivated to combine Geus and Ikeda to achieve the electrode material set forth in claims 9, 10 or 11 or the lithium secondary batteries set forth in claims 12 and 13.

For at least the foregoing reasons, Applicants respectfully submit that Geus, either alone or in combination with Ikeda, would not have rendered claims 9-13 obvious. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

### **III. Conclusion**

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-13 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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JAO:JMS/jcp

Attachments:

Terminal Disclaimer  
English Language Translation of  
JP 2001-162185  
English Language Translation of  
JP 2001-260430

Date: October 22, 2003

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